



Clarification for 14 CFR Part 33.83 Vibration Test

Comments on the Draft Policy Statement PS-ANE-33.83-01
published online for public comment at http://www.faa.gov/aircraft/draft_docs/policy/

Submitted to Dorina Mihail via email to dorina.mihail@faa.gov

**Submitted by the
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Submitted to Dorina Mihail via email to dorina.mihail@faa.gov

November 21, 2014

Ms. Dorina Mihail
Federal Aviation Administration
Engine and Propeller Directorate
Standards Staff, ANE-111
12 New England Executive Park
Burlington, MA 01803

Dear Ms. Mihail:

Please accept these comments in response to Draft Policy Statement PS-ANE-33.83-01, Clarification for 14 CFR Part 33.83 Vibration Test, which was published for public comment at http://www.faa.gov/aircraft/draft_docs/policy/.

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Who is MARPA?

The Modification and Replacement Parts Association was founded to support PMA manufacturers and their customers. Aircraft parts are a vital sector of the aviation industry, and MARPA acts to represent the interests of the manufacturers of this vital resource before the FAA and other government agencies.

MARPA is a Washington, D.C.-based, non-profit association that supports its members' business efforts by promoting excellence in production standards for PMA parts. The Association represents its members before aviation policy makers, giving them a voice in Washington D.C. to prevent unnecessary or unfair regulatory burden while at the same time working with aviation authorities to help improve the aviation industry's already-impressive safety record.

MARPA represents a diverse group of manufacturing interests – from the smallest companies to the largest - all dedicated to excellence in producing aircraft parts.

MARPA members are committed to supporting the aviation industry with safe aircraft components including engine parts. MARPA members design, manufacture, and sell aircraft components that provide equal or better levels of reliability when compared to their original equipment manufacturer competitors.

MARPA supports efforts to produce guidance that increases the aviation industry's already excellent safety record.

Comments

The Policy Statement Should Clarify that it applies only to Full Engine Surveys and that Discrete Components such as PMA Parts are addressed by Other FAA Guidance Documents.

Issue

The Policy Statement seeks to clarify that the vibration surveys and engine surveys required by 14 C.F.R. § 33.83(a) are intended to be implemented by engine test. Because the Policy Statement addresses the “appropriate combination of experience, analysis and component test”¹ there is a risk that the Policy Statement could be read to require testing of components at the piece-part level. The Policy Statement should clarify that such engine tests apply to full engine tests, and not the test of individual components manufactured under an FAA approval, such as a PMA. Vibratory compliance for PMA is addressed by existing FAA guidance material.

¹ FAA Draft Policy Statement PS-ANE-33.83-01, [Clarification for 14 CFR Part 33.83 Vibration Test](#) at 1.

Discussion

Draft Policy Statement PS-ANE-33.83-01 “clarifies that the required vibration surveys and engine surveys of § 33.83(a) are intended to be implement by engine test.”² The statement explains that historically the “vibration survey requirement was consistently interpreted and applied by running an engine vibration test for each type of certificated engine design.”³

Section 33.83(a) reads as follows:

(a) Each engine must undergo vibration surveys to establish that the vibration characteristics of those components that may be subject to mechanically or aerodynamically induced vibratory excitations are acceptable throughout the declared flight envelope. The engine surveys shall be based upon an appropriate combination of experience, analysis, and component test and shall address, as a minimum, blades, vanes, rotor discs, spacers, and rotor shafts.⁴

Both the plain language of the regulation and past practice demonstrate that the vibration test described by § 33.83 is intended to apply at the product level, that is, to full engines, and not to individual components standing alone. As § 33.83(a) states, the engine survey itself is based upon a combination of “experience, analysis, and component test.”⁵ This collective action constitutes the engine survey, as required by § 33.83(a). This understanding is further supported by the statement that “[e]ach engine must undergo vibration surveys.”⁶ If each component were intended to be put through a vibration test independent of the completed product, the regulation would clearly call out individual component vibration testing. Therefore it is apparent that the vibration survey is intended to apply only to the full engine.⁷

Because the “engine surveys shall be based upon an appropriate combination of experience, analysis, and component test,” it is possible that the Policy Statement (and the regulation itself) may be mistakenly read to require independent component testing to satisfy the elements of the vibration survey requirement of § 33.83(a). This may be particularly likely to happen in the case of a PMA engine part, which is designed and produced independent of the type design and therefore in most cases would not have been subject to the full engine vibration survey. Requiring a vibration survey for individual PMA parts, however, would be incorrect for two reasons.

The first reason, discussed above, is that the plain language and past practice indicate the vibration survey is intended only to apply to full engines. The second reason is that existing FAA guidance already sufficiently addresses the vibratory stress concerns contemplated by § 33.83.

² Id.

³ Id. (emphasis added).

⁴ 14 C.F.R. § 33.83(a) (emphasis added).

⁵ Id.

⁶ Id. (emphasis added).

⁷ Additional support for this proposition is found in paragraph 3.b. of the Policy Statement. In explaining the 1996 amendment 33-17, the preamble to the Notice of Proposed Rulemaking explained that the amendment would “retain] the current practice of the FAA and JAA of limiting formal certification test requirements to only the final engine or major assembly rig vibration test.” See PS-ANE-33.83-01 at 2 (emphasis added).

Two FAA Advisory Circulars in particular address PMA engine part concerns and PMA engine part vibratory stress concerns: FAA AC 33-8 Guidance for Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts under Test and Computation and FAA AC 33.83-1 Comparative Method to Show Equivalent Vibratory Stresses and High Cycle Fatigue Capability for Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts.

Advisory Circular 33-8 “provides guidance for developing substantiation data to support the design approval of critical and complex turbine engine and auxiliary power unit” PMA parts.⁸ The guidance applies to the test and comparative analysis method used to show compliance to 14 C.F.R. § 21.303 airworthiness requirements, and support showing the engine or APU complies with 14 C.F.R. part 33 (Airworthiness Standards: Aircraft Engines).⁹

AC 33-8 explains in its background that “PMA applicants can show compliance to the airworthiness requirements of the product, i.e., engine certification basis, on which their proposed PMA part is to be installed under test and computation through comparative or general test and analysis, or a combination of both.”¹⁰ In showing compliance with part 33, the applicant should “demonstrate that the functional design of their proposed PMA part is at least equal to that of the original type design part.”¹¹ Because complex or critical engine parts may require additional test and analysis to demonstrate equivalency, the test and substantiation plan submitted by applicants should reflect that complexity.¹² The guidance goes on to suggest the factors and data an applicant may wish to consider in demonstrating airworthiness, but does not specifically identify or require vibration surveys.¹³

Additionally, specific guidance with respect to vibratory stresses and fatigue is found in AC 33.83-1. The AC “describes a comparative test and analysis method” for engine and APU blades and vanes produced under PMA.¹⁴ PMA applicants are entitled to use the method described in the AC “to show the vibratory stress and [high-cycle fatigue] capability of their proposed blades or vanes are equivalent to those of the type design part.”¹⁵ The guidance explains:

Certification of the original type design of an engine to § 33.83 is based on an instrumented engine test (vibration survey) which requires measurement of vibratory stresses of engine parts Using this comparative test and analysis approach, the PMA blade should have vibratory and steady stresses, as well as ultimate and fatigue strength, equivalent to the type design blade.¹⁶

⁸ FAA Advisory Circular 33-8 Guidance for Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts under Test and Computation (Aug. 19, 2009) at 1.

⁹ Id.

¹⁰ Id. at 2

¹¹ Id.

¹² Id. at 2-3.

¹³ See generally id. at 7-11 (explaining that applicants must develop substantiation data related to the airworthiness or TSO requirements of the part design based on an understanding of the part’s functionality and operating conditions.)

¹⁴ FAA Advisory Circular 33.83-1 Comparative Method to Show Equivalent Vibratory Stresses and High Cycle Fatigue Capability for Parts Manufacturer Approval of Turbine Engine and Auxiliary Power Unit Parts (Sept. 9, 2009) at 1.

¹⁵ Id.

¹⁶ Id. at 4.

The issuance of these ACs makes clear that the FAA has considered those PMA applications for which additional guidance is necessary to assist the applicant in compliance with the relevant regulations. Furthermore, the two ACs specifically addressing engine part and vibration issues are in addition to the primary PMA guidance found in AC 21.303-4 Application For Parts Manufacturer Approval Via Tests and Computations or Identicality. An applicant complying with the regulations and the FAA Advisory Circulars supporting those regulations can be expected to satisfy the airworthiness requirements described therein.

Recommendation

MARPA recognizes that the Draft Policy Statement is not intended to apply to PMA parts. However, because of the potential for confusion, MARPA recommends including a clarifying statement to emphasize that PS-ANE-33.83-01 applies only to full engine testing of original type design, and not to PMA parts produced for those types. We suggest the following language be included under section 2 Current Regulatory and Advisory Material:

This Policy Statement applies to full engine vibration surveys as described in § 33.83. Guidance for PMA part applications for engine and APU parts can be found in FAA Advisory Circulars 21.303-4, 33-8, 33.83-1, and FAA Order 8110.42D.

Section 2 also contains the following statement: “Advisory Circular AC33-83A provides acceptable means of compliance with the engine vibration survey requirements of § 33.83.”

We recommend the sentence be replaced with the following proposed language:

Advisory Circular AC33-83A provides guidance and an acceptable method to demonstrate compliance with the engine vibration survey requirements of § 33.83 in support of a Type Certificate application, or changes to Type Certificates.

Advisory Circular AC33.83-1 provides guidance and an acceptable method to show the vibratory stresses and HCF capability of PMA blades or vanes are equivalent to those of the type design parts. This guidance and method shows that the engine or APU still complies with the requirements of § 33.83 in support of a PMA application.

Conclusion

MARPA looks forward to working with the FAA to better improve aviation safety. We are happy to sit down with you to work on ways to clarify guidance and policy if you would like further input. Your consideration of these comments is greatly appreciated.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Ryan Aggergaard". The signature is fluid and cursive, with the first name "Ryan" written in a more compact, rounded style and the last name "Aggergaard" written in a more elongated, flowing script.

Ryan Aggergaard
Associate Counsel
Modification and Replacement Parts Association